PSYCHOLOGY MISCELLANY

No.56 Supplement - February 2014

Snippets of Developmental Psychology

Kevin Brewer

ISSN: 1754-2200

Orsett Psychological Services
PO Box 179
Grays
Essex
RM16 3EW
UK

orsettpsychologicalservices@phonecoop.coop

This document is produced under two principles:

1. All work is sourced to the original authors. Most of the images are available in the public domain (mainly from http://commons.wikimedia.org/wiki/Main_Page). You are free to use this document, but, please, quote the source (Kevin Brewer 2014) and do not claim it as you own work.

2. Details of the author are included so that the level of expertise of the writer can be assessed. This compares to documents which are not named and it is not possible to tell if the writer has any knowledge about their subject.

Kevin Brewer BSocSc, MSc

An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at http://kmbpsychology.jottit.com.

CONTENTS

	Page Number
1. Surrogacy	4
2. Incentives to breastfeed and care for children's health	9
3. Birth order	13
4. Exercise and nutrition during pregnancy	15
5. Age to begin formal schooling	17
6. Language development	19
7. Cross-sectional versus longitudinal design	22
8. Children's perception of social differences	23
9. Non-parental role models	25
10. Some observations on gender differences	28
11. Epigenetics	36
12. Establishing co-morbidity	39

1. SURROGACY

Surrogacy (or "contractual parenting") "occurs when a couple, the intended parents, contracts with a woman to carry a child for them and to relinquish that child to them after birth" (Ciccarelli and Beckman 2005 p21) [1]. Gestational carrier surrogacy [2] is where the woman carries the fertilised egg of the couple, and has no genetic connection to the child. But in traditional surrogacy [3], the woman is impregnated by sperm of the male of the couple (via artificial insemination, say), and so she is the genetic mother (Ciccarelli and Beckman 2005). The distinction between commercial and altruistic surrogacy (no personal gain to surrogate mother) can also be made (Constantinidis and Cook 2012).

Ciccarelli and Beckman's (2005) literature review of 27 studies of surrogacy between 1983 and 2003 drew out a number of issues for the adult involved.

1. Attitudes about surrogacy.

It has less public approval than other assisted reproduction techniques (eg: IVF), especially when payment is involved for the surrogate mother.

For example, in Australia, 32% approved (and 44% disapproved) of gestational surrogacy in 1982, but 53% approved (and 36% disapproved) when it called "altruistic surrogacy" in 1993 (Kovacs et al 2003).

More recently, Constantinidis and Cook (2012) found greater support in a survey of 92 university students and 103 adults in Victoria, Australia, using the Attitudes to Surrogate Parenthood Questionnaire (ASPQ). This includes general questions about surrogacy (and IVF) as well as specific types of surrogacy. One section is called the Cognitive Concerns About Issues Related to Surrogacy Scale (CCAIRSS). This has fifteen attitudes statements like "The surrogate mother will have problems letting go of the baby once it has been born". Respondents also completed a personality measure.

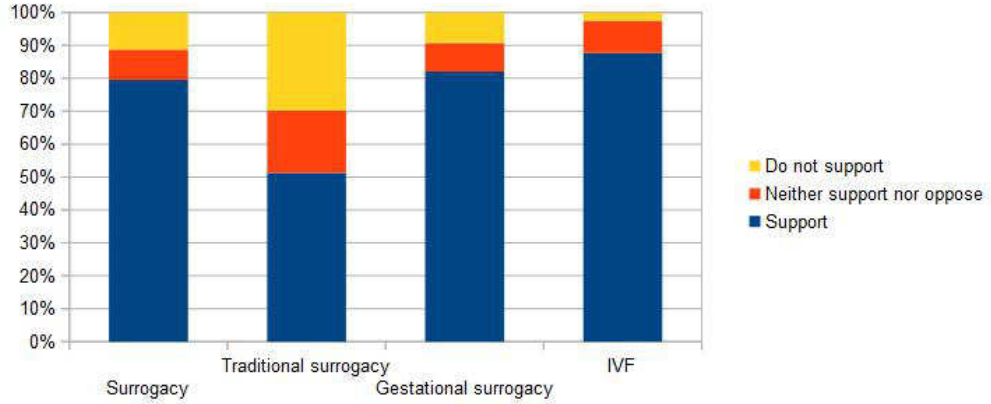
Overall, 79.5% of respondents indicated support for surrogate parenthood where "women cannot sustain a pregnancy", but this was significantly less than the support for IVF in the same situation. Support for gestational surrogacy was 82.1%, but only 51.3% for traditional surrogacy ($p<0.001$) (figure 1.1). With the

[1] The surrogate mother can be known to the couple (eg: family members; friends) or unknown (eg: via commercial organisation).

[2] Also called full or host surrogacy (Jadva et al 2012).

[3] Also called genetic, partial or straight surrogacy (Jadva et al 2012).

CCAIRSS, respondents had significantly greater concerns for traditional than gestational surrogacy. Personality differences did not predict attitudes to surrogacy.



(Data from Constantinidis and Cook (2012) tables III and IV p1084)

Figure 1.1 - Percentage of respondents and surrogacy.

Constantinidis and Cook (2012) offered two possible reasons for the higher support than other Australian studies - a self-selected sample of well-educated and "perhaps liberal minded" respondents(eg: friends and associates of the researchers), and limited information as "low incidence of surrogacy and consequent lack of personal relevance to many Australians".

2. Motivation of surrogate mothers.

In self-reported surveys, surrogate mothers tend to list money as the motivation behind more altruistic motives like empathy for childless couples, or report enjoying pregnancy or having experienced a prior loss themselves (eg: abortion; given up child for adoption). But Ragane (1994) suggested that these self-reports were just the socially acceptable answers.

3. Personality of surrogate mothers.

A limited number of studies have been carried out here, and there are methodological weaknesses with them (eg: small sample). As a generalisation, "most surrogate mothers are within the normal range on personality tests", but they be more independent, and less bound by traditional moral values" (Ciccarelli and Beckman 2005).

The most common measure of personality generally is the Minnesota Multiphasic Personality Inventory-2nd

Edition (MMPI-2) (Butcher et al 1989). This has 567 self-reported true or false statements, divided into 68 scales. The large number of statements is a way to check for inconsistency or false responses. The MMPI-2 has been used to assess the personality of surrogate mothers.

Franks (1981), for example, found that ten surrogate mothers were more extravert, and more feminine (eg: nurturing) than the average on the first version of the MMPI.

Pizitz et al (2013) used the MMPI-2 with 43 randomly selected surrogate mother candidates in the USA. The means of the women were compared to an average female group (normative sample). Thirty-three scales showed significant differences. The surrogate mother candidates were concerned about a favourable presentation of themselves (eg: higher on Lie Scale), and "made an effort to appear void of misgivings or undesirable features, as well as an interest in trying to portray oneself in a positive light. Considering the motivation for becoming a surrogate mother often holds many rewards, both altruistic and tangible, this approach to the assessment is not unexpected. While the surrogate mother candidates appeared well aware of the evaluative focus of the assessment by focusing appreciably on strengths and capabilities, they did so without systematically invalidating or rendering their psychological profiles clinically useless or invalid" (Pizitz et al 2013 p e19).

They also endorsed more stereotypically masculine items (eg: assertiveness; competitive), and more "ego strength" statements (ie: ability to cope with stress and conflict). "Furthermore, surrogate mother candidates exhibit a strong sense of self-worth and altruism in the assistance and gift they are able to provide to the intended parents the child(ren) that she carries. Surrogate mother candidates are inclined to take a serious approach to their responsibilities, extolling a sense of duty in their endeavours. Finally, surrogate mother candidates endorse lower levels of anxiety and tension than the normative female sample, experiencing less frustration, more contentment, and a greater sense of peace" (Pizitz et al 2013 p e19).

4. Satisfaction experienced by surrogate mothers.

Ciccarelli (1997 quoted in Ciccarelli and Beckman 2005) found good levels of satisfaction with the experience among fourteen Californian surrogates in their 20s and 30s. Relationship with the contracting couple, and expectations about surrogacy were key. For example, two dissatisfied women reported unmet expectations about the level of closeness with the contracting parents.

5. Other relationships of surrogate mothers.

In Ciccarelli's (1997 quoted in Ciccarelli and Beckman 2005) study, over half the women reported being closer to their family because of the experience including positively for their own children.

6. Negative aspects of surrogacy.

For example, general side effects of pregnancy; emotional distress at giving up the child at birth (eg: around one-quarter; Blyth 1994).

7. Experience of contracting parents.

For example, the nature of relationship with surrogate mother (including after birth); whether to tell relatives and friends.

Golombok et al (2004) interviewed 42 parents of surrogates, and compared them to 51 parents of child via egg donation assisted reproduction technology and 80 parents of naturally conceived children in the UK when the child was 7-12 months old. No differences were found between the three groups in terms of parents' psychological state, though the mothers of surrogates scored significantly lower on a depression scale. Overall, the "differences that were identified between the surrogacy families and the other family types indicated greater psychological well-being and adaptation to parenthood by mothers and fathers of children born through surrogacy arrangements than by the natural-conception parents" (Golombok et al 2004 p400).

This sample of 42 parents were followed up after seven years, and ten years (n = 33) (Jadva et al 2012).

Jadva et al (2012) investigated the parents' and children's relationship with the surrogate mother up to age 10 years. The frequency of contact declined as the child grew. The frequency of contact in the past year was rated as "not at all" (0) to "more than once a week" (4). At age 1 year, the mean was 2.5 for mothers, fathers, and children, but 1.6 by age 10 years (though there was a difference depending on the type of surrogacy, and whether the surrogate mother was previously known to the parents). The strongest relationship was between mothers and previously known surrogate mothers [4].

At age ten years, the relationship quality for those in contact was "harmonious". Only 3% of mothers and 5% of

[4] Note that the parents were not asked why contact had declined nor were the surrogate mothers interviewed by Jadva et al (2012).

fathers rated the relationship with the surrogate mother as having "major conflict or hostility". This used a three-point scale where the other two choices were "harmonious" or "some dissatisfaction or coldness".

REFERENCES

Blyth, E (1994) "I wanted to be interesting. I wanted to be able to say 'I've done something with my life'": Interviews with surrogate mothers in Britain Journal of Reproductive and Infant Psychology 12, 189-198

Butcher, J.N et al (1989) MMPI-2: Manual for Administration and Scoring Minneapolis, MN: University of Minnesota Press

Ciccarelli, J.C & Beckman, L.J (2005) Navigating rough waters: An overview of psychological aspects of surrogacy Journal of Social Issues 61, 1, 21-43

Constantinidis, D & Cook, R (2012) Australian perspectives on surrogacy: The influence of cognitions, psychological and demographic characteristics Human Reproduction 27, 4, 1080-1087

Franks, D.D (1981) Psychiatric evaluation of women in a surrogate mother program American Journal of Psychiatry 138, 1378-1379

Golombok, S et al (2004) Families created through surrogacy arrangements: Parent-child relationships in the first year of life Developmental Psychology 40, 3, 400-411

Jadva, V et al (2012) Surrogacy families 10 years on: Relationship with the surrogate, decisions over disclosure and children's understanding of their surrogacy origins Human Reproduction 27, 10, 3008-3014

Kovacs, G.T et al (2003) Community attitudes to assisted reproductive technology: A 20-year trend Medical Journal of Australia 179, 10, 356-358

Pizitz, T.D et al (2013) Do women who choose to become surrogate mothers have different psychological profiles compared to a normative female sample? Women and Birth 26, 1, e15-e20

Ragone, H (1994) Surrogate Motherhood: Conception in the Heart Boulder, CO: Westview Press

2. INCENTIVES TO BREASTFEED AND CARE FOR CHILDREN'S HEALTH

BREASTFEEDING

An incentive to improve health behaviour is defined by the National Institute for Health and Clinical Excellence (NICE) in the UK as "a thing of perceived positive value offered in order that a desirable health outcome may be obtained, to motivate or encourage an individual to change his or her behaviour" (quoted in Thomson et al 2012). There are also negative incentives, like financial loss for failure to perform a behaviour or achieve a target (Thomson et al 2012).

Incentives have been reported as effective for one-off behaviours (eg: attending an appointment), but inconclusive for complex behaviours like smoking cessation, particularly because the change is not sustained after the incentive is stopped (Thomson et al 2012).

In terms of incentives to encourage breastfeeding of babies by their mothers, the findings are also inconclusive (Thomson et al 2012). Positively, Sciacca et al (1995) did find an increase in breastfeeding for the first three months of life among 68 mothers in a Special Supplemental Food Program for Women, Infants and Children (WIC) in the USA. The incentives offered to low-income pregnant and lactating women included gift vouchers, and tickets to local sports events for their partners. While a study of 130 women on a WIC in another part of the USA found no increase (Murimi et al 2010) [5].

Thomson et al (2012) investigated the meaning of incentives (ie: qualitative outcome) to breastfeeding women as well as the quantitative outcome (increased rates of breastfeeding). In a disadvantaged part of north-west England, "Star Buddies", which provided peer support in pregnancy and up to two months after birth, along with incentives (table 2.1), was run by the Breastfeeding Network (BfN) and the local health authority between 2008 and 2011. Breastfeeding, defined as "any breast milk given within the previous 24 hours", at 6-8 weeks old increased from 19.2% to 29.9% of mothers.

Ninety-four women undertook the programme for eight weeks, and Thomson et al (2012) interviewed 26 of them. The qualitative interviews suggested that the motivation to breastfeed was more influenced by the connections and

[5] New Scientist (2013) reported a pilot scheme to give mothers shopping vouchers as the incentive to breastfeed in the first six months. The scheme was known as Nourishing Start for Health (NOSH), and run in the north of England.

- Week 1 - picture frame.
- Week 2 - selection of healthy treats ("graze box").
- Week 3 - "Mum's pamper gift".
- Week 4 - Choice of glossy magazine.
- Week 5 - Hot drink/cake from department store.
- Week 6 - Swimming voucher.
- Week 7 - Voucher for quality ready-made family meal deal.
- Week 8 - Pamper session.

Table 2.1 - Incentives given out by "Star Buddies".

relationships with peers than by the incentives. For example, "Rose" said: "It was fantastic, it was such a treat to get something. I mean I was just so happy to be getting her time and her advice, the fact that I was getting like a magazine and so many little treats to go along with it, was just a massive bonus really".

While "Erica" saw the weekly visit of the "Star Buddy" as a "lifeline" to the outside world: "Because when you're sitting in your house on your own and your other half is at work, and it's just you day after day after day at home with your child, you begin to feel very isolated and you begin to feel very on your own. And having her coming every Friday, you know, it's a colossal difference". "Lucille" noted the opportunity to "open up": "He [husband] was getting a bit frustrated, so I couldn't really vent as much to him. So as soon as X [Star Buddy] came round I was like, just let rip. So yes, I definitely did look forward to it".

The authors concluded: "Meaningful relationships were formed between peer supporters and mothers as they were 'on the journey together'. These relationships encouraged dialogues around sensitive issues, enabling targeted and authentic support to be provided in this disadvantaged community, with rewards for both women and the peer supporters" (Thomson et al 2012).

CHILDREN'S HEALTH

Bassani et al (2013) outlined seven types of financial incentive used with health programmes around the world:

i) Unconditional cash transfer - giving money to individuals without conditions.

ii) Conditional cash transfer - giving money to individuals only if certain conditions are fulfilled (eg: taking child to preventive health-care appointment).

iii) Unconditional micro-credit - small loans to individuals without conditions, other than repayment.

iv) Conditional micro-credit - small loans offered to individuals who adopt certain behaviours (eg: keeping children's vaccines up-to-date).

v) Unconditional voucher - giving money indirectly to individuals (eg: via food vouchers).

vi) Conditional voucher - giving individuals vouchers etc for adopting and maintaining certain behaviours (eg: school attendance).

vii) User fee removal - removal of fees for accessing health services.

Bassani et al (2013) reviewed all studies, up to September 2012, of these financial incentives in relation to child health in low- and middle-income countries, and 25 studies covering five health areas were found [6].

1. Breastfeeding - In a limited number of studies, conditional micro-credit had a small positive impact in encouraging breast-feeding.

2. Child vaccines - Conditional cash transfer programmes showed a slight improvement in uptake of age-appropriate vaccines, but no significant improvement for conditional cash transfer and micro-credit programmes.

3. Use of health-care services - Conditional cash transfer programmes produced an average 14% increase in preventive and curative use compared to controls, while user fee removal was highly effective in encouraging parents to take ill children to the clinic/doctor (curative use) (though the study designs were poor in each case).

4. Management of infant diarrhoea (eg: use of oral rehydration solution; ORS) - Few, poor quality studies which suggest little benefits of financial incentives here.

5. Other preventive health measures - For example, moderate quality evidence that conditional cash transfer programmes increase the use of child vitamin A supplements.

Bassani et al (2013) concluded that there was little high or moderate quality evidence to support the use of financial incentive programmes to encourage parents in child health behaviours in low- and middle-income

[6] Thirteen studies were performed in South America or the Caribbean, eight in Africa, and four in South-East Asia.

countries. High quality evidence means peer-reviewed, randomised trials (ie: a comparison group not receiving the incentive).

Where the financial incentives were effective, the studies tended to be low quality (not peer-reviewed and/or poor methodology). Conditional programmes seem to be better than unconditional ones. Overall, the greatest effect was user fee removal (ie: making health-care services free).

REFERENCES

Bassani, D.G et al (2013) Financial incentives and coverage of child health interventions: A systematic review and meta-analysis BMC Public Health 13, supplement 3, S30

Murimi, M et al (2010) Factors that influence breastfeeding decisions among Special Supplemental Nutrition Program for Women, Infants and Children participants from central Louisiana Journal of American Dietetic Association 110, 624-627

New Scientist (2013) Mum's milk money New Scientist 16/11, p5

Sciacca, J.P et al (1995) Influences on breastfeeding by lower income women: An incentive based partner-support educational program Journal of American Dietetic Association 95, 323-328

Thomson, G et al (2012) Incentives as connectors: Insights into a breastfeeding incentive intervention in a disadvantaged area of North-West England BMC Pregnancy and Childbirth 12, 22

3. BIRTH ORDER

Francis Galton in 1874 noted that firstborn sons were more often in prominent positions in science. This set the idea that birth order determined personality.

Alfred Adler in the 1920s and 1930s used psychoanalytic concepts to explain how birth order does set personality. For example, firstborns experience "dethronement" with the arrival of a sibling - ie: the loss of centre of attention - and this motivates them to "regain" the attention by achievements. The younger siblings are behind the "pacesetters" (firstborns), and this has an effect on personality development (Hartshorne et al 2009).

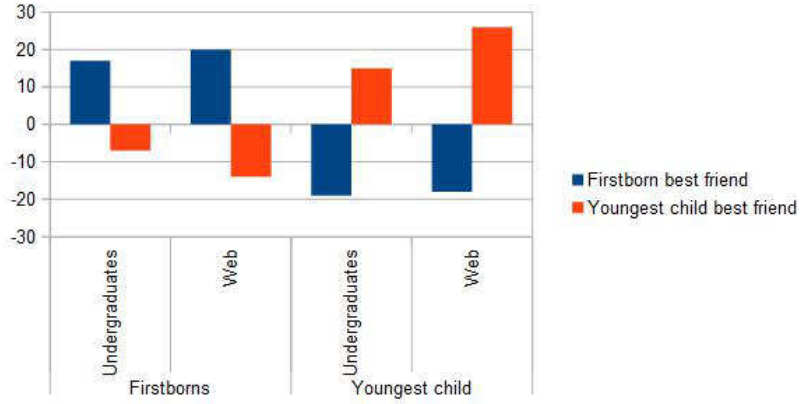
Belmont and Marolla's (1973) influential study of Dutch men found a negative correlation between birth order and intelligence. In other words, firstborns are more intelligent than later-borns.

Popular psychology books tend to quote everyday examples of associations as causations. For example, 21 of the first 23 astronauts into space were firstborns. But this could show that astronauts come from wealthier and smaller families, who put more resources into their children than that being the firstborn determines the personality that leads to being astronaut success (Hartshorne 2010). The latter could be true, but an association/correlation is not the same as causation. The problem is evidence to establish causation.

One explanation for firstborns being more intelligent is favourable conditions in the family for firstborns that produces intellectual stimulation, and this declines with each subsequent child (Kristensen and Bjerkedal 2007).

Kristensen and Bjerkedal (2007) presented data from 250 000 Norwegian military conscripts that social rank in the family is more influential on intelligence than birth order. For example, a second-born child who grows up in a family where the firstborn has died will have the social rank of firstborn. The researchers found a similar mean IQ score for firstborns, second-borns where the elder sibling had died, and third-borns where two elder siblings had died.

Hartshorne et al (2009) found a similarity in birth order among close friends and lovers (ie: firstborns with firstborns etc) using data from undergraduates in the USA, and a web-based survey (figure 3.1).



(Eg: 129 firstborn undergraduates had firstborn best friends compared to 112 predicted by chance for the sample = 17)

(Data from Hartshorne et al 2009)

Figure 3.1 - Number of firstborns and youngest child and similar birth order best friends compared to chance.

REFERENCES

Belmont, L & Marolla, F.A (1973) Birth order, family size and intelligence Science 182, 1096-1101

Galton, F (1874) English Men of Science London: Macmillan

Hartshorne, J.K (2010) Ruled by birth order? Scientific American Mind January/February, 18-19

Hartshorne, J.K et al (2009) Birth order effects in the formation of long-term relationships Journal of Individual Psychology 65, 156-176

Kristensen, P & Bjerkedal, T (2007) Explaining the relation between birth order and intelligence Science 316, p1717

4. EXERCISE AND NUTRITION DURING PREGNANCY

EXERCISE

Studies with rats have found that mothers who exercised during pregnancy (eg: 30 minutes of treadmill running five days per week) give birth to offspring with a larger hippocampus, and have better memory that pups of non-exercising mothers (eg: Pampiansil et al 2003).

In terms of humans, Clapp et al (1999) compared active women who continued to do exercise during pregnancy (eg: running three times a week) and those who volunteered to stop when pregnant. The children of active pregnant mothers scored higher on tests of cognitive abilities at five days, one year, and five years old (LeMoyne et al 2012). But there was no direct measure of brain changes, and the two groups were self-selecting (LeMoyne et al 2012).

LeMoyne et al (2012) outlined the details of a randomised controlled trial in the Montreal area of Canada, which allocated volunteers to exercise or not during pregnancy. The exercise was twenty minutes at least three times a week at an intensity of 55% of VO^2max (from week 12 of pregnancy onwards).

The outcome measure was the electrical brain activity of the 8-12 day-old in response to a series of auditory tones (known as the means of the mismatched negativity; MMN). This is taken as a measure of the developmental maturity of the brain.

Interim results of the study were reported by Labonte-LeMoyne (Geddes 2013) with 29 participants. The babies of exercising mothers had more mature brains.

NUTRITION

Maternal depression can negatively affect the development of children after birth through a number of possible mechanisms like maladaptive parenting. Depression during pregnancy also has an affect through cortisol, for example (Barker et al 2013).

Recent research by Barker et al (2013) found evidence of changes in eating habits due to depression while pregnant having effects on the children's subsequent cognitive development. The researchers analysed data from the Avon Longitudinal Study of Parents and Children (ALSPAC) [7] [8], which is based on over 13867

[7] Originally called the Avon Longitudinal Study of Pregnancy and Childhood. Sometimes known as the "Children of the 90s" (Boyd et al 2013).

[8] Official website of study at http://www.bris.ac.uk/alspac/.

women [9] who gave birth between 1st April 1991 and 31st December 1992 in a region of south-west England [10] [11] [12] [13]. Maternal depression at 32 weeks pregnant and self-reported diet at that time were related to the child's IQ score at eight years old. A higher depression score was related to lower levels of nutrition and higher levels of unhealthy nutrition, and this was associated with the future lower IQ of the child. Certain nutrients (eg: protein, vitamin B) in the maternal diet are known to have effects on brain development in the womb.

REFERENCES

Barker, E.D et al (2013) Prenatal maternal depression symptoms and nutrition, and child cognitive function British Journal of Psychiatry 203, 417-421

Boyd, A et al (2013) Cohort profile: The "Children of the 90s" - the index offpsring of the Avon Longitudinal Study of Parents and Children International Journal of Epidemiology 42, 111-127

Clapp, J.F et al (1999) Neonatal behavioural profile of the offspring of women who continued to exercise regularly throughout pregnancy American Journal of Obstetrics and Gynecology 180, 91-94

Frasier, A et al (2013) Cohort profile: The Avon Longitudinal Study of Parents and Children: ALSPAC mothers cohort International Journal of Epidemiology 42, 97-110

Geddes, L (2013) Bouncing babies get a boost for their brains New Scientist 16/11, p10

LeMoyne, E.L et al (2012) The effects of exercise during pregnancy on the newborn's brain: Study protocol for a randomised controlled trial Trials 13, 68

O'Connor, T.G et al (2002) Maternal ante-natal anxiety and children's behavioural/emotional problems at four years. Report from the Avon Longitudinal Study of Parents and Children British Journal of Psychiatry 180, 502-508

Pampiansil, P et al (2003) Exercise during pregnancy increases hippocampal brain-derived neurotrophic factor in mRNA expression and spatial learning in neo-natal rat pup Neuroscience Letters 352, 45-48

[9] 2473 women have completed all eighteen questionnaires to date (Frasier et al 2013).

[10] Around and including the city of Bristol (ie: 3 health administration districts - Southmead, Frenchay, and Bristol and Weston.

[11] The sample was representative of the British population in the main, though there were slightly more married women in the study (79.4% vs 71.4% in the whole of Britain), and less non-White participants (2.2% vs 7.6% in 1991 census).

[12] Many different measures have been collected over the years including self-reported questionnaires on health and mental health, obstetric data, and physiological measures (eg: blood samples) (Frasier et al 2013).

[13] A key finding of ALSPAC has been the kink between pre-natal maternal anxiety and childhood behaviour (eg: O'Connor et al 2002).

5. AGE TO BEGIN FORMAL SCHOOLING

At what age should a child begin formal schooling? In the UK it is 4-5 years old, but 7 years old in Sweden and Finland. An official report in the UK suggested making the starting age 2 years old (Whitebread and Bingham 2013).

The main argument against early formal schooling is that the opportunity for child to play is restricted. Whitebread et al (2012) noted: "Given the abundant nature of the research evidence that play in humans is adaptive and is fundamental in supporting a whole range of intellectual, emotional and social abilities, it seems self-evident that children who, for whatever reason, play very little or not at all will be disadvantaged in their development" (p28).

However, laboratory experiments that prevent children playing would be unethical. Studies with rats, though, show negative consequences to play deprivation (eg: less neural connections in the growing brain; Pellis and Pellis 2000).

In real life situations where children have suffered deprivation generally (eg: Romanian orphanages), lack of play has been associated with developmental problems. Whitebread et al (2012) offered a note of caution, however: "The difficulty with much of this evidence, of course, is that the lack of play, or its provision, is just part of an overall pattern of deprivation or provision, and so it is impossible to conclude that the play experience per se was entirely responsible for the outcomes" (p28).

However, Taneja et al (2002) reported the benefits of introducing structured play sessions into an Indian orphanage. The children showed significant improvements on measures of motor, cognitive, and social functioning.

Whitebread and Bingham (2013) summarised three other key findings:

- Play leads to greater learning and motivation than formal instruction at an early age.
- Imaginary play has been linked to language development.
- In a New Zealand study, five year-old school starters had less positive attitudes about reading and text comprehension at age eleven than seven year-old starters.

REFERENCES

Pellis, S & Pellis, V (2000) The Playful Brain: Venturing to the Limits of Neuroscience Oxford: One World Publications

Taneja, V et al (2002) "Not by bread alone": Impact of a structured ninety-minute play session on development of children in an orphanage Child: Care, Health and Development 28, 95-100

Whitebread, D et al (2012) The Importance of Play Report commissioned for Toy Industries of Europe

Whitebread, D & Bingham, S (2013) Too much too young New Scientist 16/11, 28-29

6. LANGUAGE DEVELOPMENT

Describing the development of children's language skills is usually done by sampling (eg: 1-2 hours per week) what can be understood and said at different ages (known as periodic observation). The Human Speechome Project (HSP) aimed to record almost everything that one child heard and said in the first three years of life (Roy et al 2006).

The child was the first born of the researchers, Deb Roy and Rupal Patel, who covered their house with microphones and video cameras. By six months old, 24 000 hours of video and 33 000 hours of audio recordings had been amassed (Roy et al 2006), and by 36 months old, 90 000 hours of video recordings and 140 000 hours of audio recordings (Roy 2009) [14].

Roy (2009) outlined some key findings from the initial analysis of the data.

a) "Word birth" - This is "the first reliably transcribed utterance of a new word type by the child" (Roy 2009). The project collected 517. The number of "word births" slowly increases from eight months old to peak at twenty months and then drops ("shark's fin curve").

b) How often the word is said and the emphasis placed on the word (as in syllable duration) predicted use of word.

c) Caregivers gradually decrease the length of their utterances containing certain words up to "word birth" and then gradually increase the complexity of these utterances.

Normal language development is assessed by comparison of the child's understanding and expression at a certain age to a normative sample.

The MacArthur-Bates Communicative Development Inventories (CDI) (Fenson et al 1993) is commonly used. On the Infant Form (covering 8-16 months old), parents tick items on a list of vocabulary that is understood and used [15]. The Toddler Form (16-30 months old) includes vocabulary and two-word sentences used. Fenson et al (2000) established normative data with 1130 toddlers and 569 infants.

---

[14] Roy et al (2006) said: "Our ultimate goal is to build computational models of language acquisition that can 'step into the shoes' of a child and learn directly from the child's experience".

[15] Woolfe et al (2010) reported the use of an adapted version of the CDI with British Sign Language in a UK sample of native deaf signers aged 8-36 months old. As with spoken language, understanding was greater than expression.

The HSP is an ultra-dense observation which has a number of advantages and issues compared to periodic observations.

a) Does not miss sudden changes (eg: new vocabulary) that sampling might. "Sparse sampling leads to a 'gallery of before and after snapshots, studio portraits of newborns, and fossilised milestones but little understanding of the process of development itself' (Adolph et al 2008)" (Roy 2009).

b) Diaries of vocabulary depend on the recall and accuracy of diary-keeping whereas HSP records everything automatically. "In contrast to diary studies, which are necessarily theory-laden (since the diarist cannot record everything, he/she must rely on theoretical biases to decide what is noteworthy at the time of observation), the Speechome corpus may be re-analysed multiple times guided by different theoretical perspectives" (Roy 2009).

c) Interactions between the parents and child are recorded, and the influence of these may be missed if parents are keeping records.

d) Data collected at home rather than in laboratory.

e) Privacy - "oops" buttons are provided which allow the adults to turn off the equipment and retrospectively permanently delete small time periods.

f) The vast amount of data collected (and thus the need for computer-assisted data analysis).

BILINGUALISM

Children raised bilingual may have advantages in cognitive abilities like mental flexibility, abstract thinking, and working memory. This is contrary to the popular view that learning two languages at the same time produces "a constant tug-of-war" leading to confusion (Westly 2011).

Petitto (2009) reported that from her studies that children raised bilingually showed no difference in language milestones (eg: age of first word; learning to read) to monolingual children.

More than that, recent studies are finding advantages to "crib bilingualism" (bilingual environment from birth). For example, Kovacs and Mehler (2009) compared cognitive flexibility among seven month-olds raised in one or two language households. The infants watched a screen where a puppet would appear in one corner after a speech-like sound. Both sets of children learned the association and the right place to look, but

bilingual children were quicker to learn when the puppet later appeared in a different corner of the screen.

REFERENCES

Fenson, L et al (1993) Guide and Technical Manual for the MacArthur Communicative Development Inventories I San Diego: Singular Press

Fenson, L et al (2000) Measuring variability in early child language: Don't shoot the messenger Child Development 71, 323-328

Kovacs, A.M & Mehler, J (2009) Cognitive gains in seven month-old bilingual infants Proceedings of the National Academy of Sciences, USA 106, 16, 6556-6660

Petitto, L-A (2009) New discoveries from the bilingual brain and mind across the lifespan: Implications for education Mind, Brain, and Education 3, 4, 185-197

Roy, D (2009) New horizons in study of child language acquisition 10th Annual Conference of the International Speech Communication Association (INTERSPEECH) Brighton, England, September 6-10

Roy, D et al (2006) The Human Speechome Project. In Vogt, P et al (eds) Symbol Grounding and Beyond Berlin: Springer-Verlag

Westly, E (2011) The bilingual advantage Scientific American Mind July/August, 38-41

Woolfe, T et al (2010) Early vocabulary development in deaf native signers: A British Sign Language adaptation of the communicative development inventories Journal of Child Psychology and Psychiatry 51, 3, 322-331

7. CROSS-SECTIONAL VERSUS LONGITUDINAL DESIGN

Watamura et al (2003) found higher levels of cortisol (taken as a measure of stress) in young children in non-family child care than at home. This was seen as evidence that non-family child care may have a negative impact on children. But this was a cross-sectional study that compared two groups - 20 10 month-olds and 35 30 month-olds measured at home and at child care.

Ouellet-Morin et al (2010) reported a longitudinal study which took measures of salivary cortisol twice a day over two consecutive days at two and three years of age. The children lived in Montreal, Canada, and attended public or private non-family child care, or family-based.

Children in non-family child care had slightly higher cortisol levels at two years old, but no difference to family-based child care at three years old. However, children in non-family child care with higher cortisol levels were those with less experience of such child care (ie: began older than sixteen months).

REFERENCES

Ouellet-Morin, I et al (2010) Diurnal cortisol secretion at home and in child care: A prospective study of two-year-old toddlers Journal of Child Psychology and Psychiatry 51, 3, 295-303

Watamura, S.E et al (2003) Morning-to-afternoon increases in cortisol concentrations for infants and toddlers at child care: Age differences and behavioural correlates Child Development 74, 1006-1020

8. CHILDREN'S PERCEPTION OF SOCIAL DIFFERENCES

In the exploration of children's perception of social differences in the UK, Sutton et al (2007) found that both rich and poor children "defined themselves in terms of what they were not rather than what they were" (p12). The researchers interviewed 42 8-13 year-olds, of which nineteen lived on a disadvantaged housing estate ("estate children"; EC) and 23 attended a fee-paying independent school ("private schoolchildren"; PS).

For example, the PS used the term "chav" to describe people who were "not necessarily poor, but were 'common' and behaved badly". One boy said: "Their parents would be a bad example, they would smoke in front of them and they would swear and drink, you know" (p13). Two views were evident: "One view would be more sympathetic, acknowledging the 'tough' job that parents have in bringing up children in poorer economic circumstances. The other view tended to blame parents for their poor parenting skills or their inability to get enough work to enable them to 'lift' children out of poverty" (Sutton et al 2007 p14).

The term "chav" was not used by the EC (rather "scallys" and "gangsters"). The EC distinguished themselves from "druggies" and "smackheads" in their neighbourhood, who were perceived as the major cause of problems in the area. "In this sense, the estate children's 'starting point' for their social continuum was different to that of the private schoolchildren. Whereas the private schoolchildren distinguished themselves from 'chavs' and rich people, the estate children suggested a continuum that ranged from 'druggies' through to posh people" (Sutton et al 2007).

The EC were negative about rich people. One boy said: "They've got money but they don't have the fun" (p15).

Sutton et al (2007) felt that "while the children share some elements in their world views – namely their desire to avoid standing out – their socio-economic backgrounds have a strong impact on their understanding of who they are and who they are not" (p16). These differences were perceived from as young as eight years old.

Differences in perception of others were in part a product of the different experiences of the children. Sutton et al (2007) summarised: "Neither group dwelt on the importance of material possessions. While the private schoolchildren suggested the importance of personal space – bedrooms and homes – the estate children clearly valued the outdoor space used for street play in their estate. This reflected the fact that, compared with the private

schoolchildren, access to organised activities could be constrained (often by cost) and the staple free-time activity was street play. Children engaged in street play were very visible as groups and liable to be suspected of being anti-social. Street play also meant that the estate children faced more tangible risks than the private schoolchildren. The private schoolchildren's movements outside of the home were usually accompanied by parents and the risks of public places seemed exaggerated. Although street play was unsupervised, the estate children gave detailed accounts of the rules and conditions set down by parents on where they could go and for how long. At the same time, friendship networks among the estate children offered some protection from the risks of street play" (p34).

More generally, Redmond (2008) observed that "economic disadvantage can lead to exclusion in a number of critical areas, including schooling, access to out-of-school activities, and interaction with peers. But... children use their agency creatively to reduce the impact of economic adversity on them and their families. However, they can also turn their agency inwards, leading to them lowering their own aspirations, excluding themselves from a range of activities, or engaging in activities that attract social disapproval".

REFERENCES

Redmond, G (2008) Children's perspectives on economic adversity: A review of the literature UNICEF Innocenti Research Centre Discussion Paper 2008-01 Innocenti Research Centre, Florence, Italy

Sutton, L et al (2007) A Child's Eye View of Social Differences York: Joseph Rowntree Foundation

9. NON-PARENTAL ROLE MODELS

The social contexts of child and adolescent development are crucial. These include family and peers, workplace, school, neighbourhood, and non-parental adult role models.

Greenberger et al (1998) found the importance of the latter for adolescents as "VIPs" or "natural mentors" or "significant others" (ie: "non-parental adults who have had a significant influence on the adolescent and on whom the adolescent can rely for support"; Chen et al 2003 p35). Non-parental adult role models can be extended family members, teachers, or coaches, for instance [16]. Greenberger et al (1998) found a positive correlation between the VIPs' behaviour and attitudes (eg: warmth and acceptance; depressive symptoms; involvement in problem behaviour), and the adolescents' socio-emotional development.

Working with the same sample, Beam et al (2002) interviewed 55 16-17 year-olds and their VIPs within a survey of 243 students at a greater Los Angeles high school in California, USA . Having a non-parental adult VIP relationship was common among all the students (82%). The quality of the relationship was rated as high, particularly with regular frequency of contact (based on four-point scale from "a few times a year" to "nearly every day"). The relationship was rated as important to the VIP adult also.

Chen et al (2003) compared the role of VIPs for 201 16 year-olds in the Los Angeles metropolitan area in California, USA, and 502 similar aged adolescents in Tianjin, China. The students completed a questionnaire anonymously at school. Initially, they were asked about "an important adult" in their lives who was not a parent, and is "someone at least 21 years old who has had a significant influence on you or whom you can count on in times of need". Sixteen categories of answer were offered including aunt/uncle, friend's parent, church representative, and no VIP. The importance of the VIP was rated from 1 ("not really all that important") to 5 ("a truly key person").

Other questions were asked about the function of the VIPs, and their attitudes as well as about the adolescents themselves.

The majority of both samples (over 80%) had a VIP, but the US adolescents rated the individual as significantly more important (figure 9.1).

[16] There were gender differences in choice of VIP. Boys named sibling, older friend, and aunt/uncle as their top choices, while girls chose grandparent, aunt/uncle, and sibling in that order.

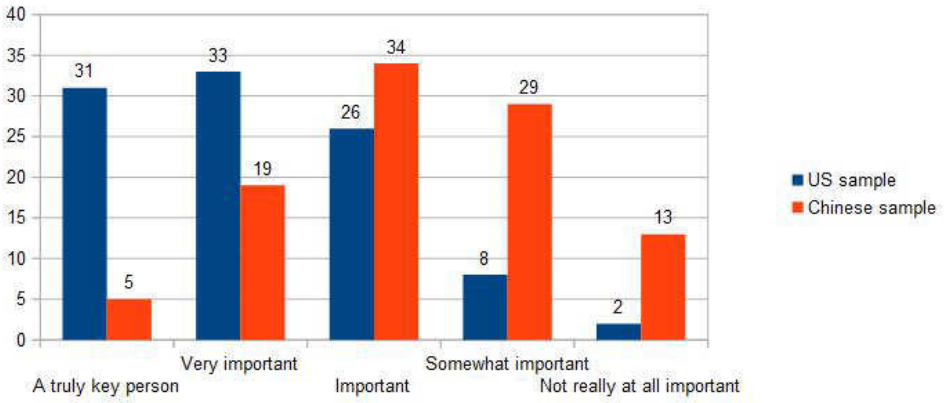


Figure 9.1 - Percentage of samples rating importance of VIP.

The Chinese students were significantly more likely to name a teacher as their VIP (table 9.1). Chen et al (2003) noted that "the greater prevalence of teachers among Chinese adolescents' VIPs is likely to result not only from the value Chinese culture places on education but by the educational practices that reinforce these values. Because Chinese teachers typically retain the same students for several years, they have enough time to develop a closer relationship than is possible with the every-year rotation of adolescents in the American education system" (p47).

US sample	Chinese sample
1.)Sibling)Aunt/uncle 3. Grandparent 4. Older friend 5. Teacher	1. Teacher 2. Aunt/uncle 3. Grandparent 4. Sibling 5. Older friend

(Based on Chen et al 2003 table 3 p43)

Table 9.1 - Five ranked most important VIPs.

The function of the VIPs also varied between the samples. The US sample mentioned "support for interpersonal issues", "fun/companionship", and "general/unspecified support" significantly more, while the Chinese students referred to "support for learning" and "role model" significantly more. Another difference was that the US students focus more on the VIP as warm and accepting, while the Chinese sample concentrated on the VIPs sanctions for problem behaviour by the adolescent.

Role models do not necessarily have to be individuals that children and adolescents know, and certainly in the age of mass media, there are plenty of role models via television, films etc.

Anderson and Cavallero (2002) questioned 179 8-13 year-olds in California about their role models and heroes. About one-third of them chose a media figure (ie: not personally known) as someone "you look up to and admire". African American and White children tended to choose figures of their own ethnicity, while Asian American and Latino children had more White media heroes. Most children chose a same-sex hero, though a quarter of girls did name a male media figure (to 6% of boys naming a female one).

"Overall, however, the most frequently named role model for kids was a parent. This is good news for parents, who must wonder, given the omnipresence of the media, whether they have any impact at all on their children. Popular culture was a significant source of heroes for children as well. Entertainers were the second most frequently named role models for the children, and the number increases significantly if you add professional athletes to that category" (Anderson and Cavallero 2002 p167).

REFERENCES

Anderson, K.J & Cavallaro, D (2002) Parents or pop culture? Children's heroes and role models Childhood Education 78, 3, 161-168

Beam, M.R et al (2002) The nature of adolescents' relationships with their "very important" non-parental adults American Journal of Community Psychology 30, 2, 305-324

Chen, C et al (2003) Beyond parents and peers: The role of important non-parental adults (VIPs) in adolescent development in China and the United States Psychology in the Schools 40, 1, 35-50

Greenberger, E et al (1998) The role of "Very Important" non-parental adults in adolescent development Journal of Youth and Adolescence 27, 321-343

10. SOME OBSERVATIONS ON GENDER DIFFERENCES

Gender or sex differences is a highly contested issue, particularly when biological-based explanations for the variations are being proposed.

The development of technology like neuroimaging has allowed the comparison of male and female brains. For example, in a recent study, Ingalhalikar et al (2013) found that in 521 female brains (aged 8-22 years), there was greater connectivity between the left and right hemispheres, while 428 male brains showed more connections within the hemispheres [17] [18]. The issue is how these differences manifest in behaviour.

Eliot (2010) observed that "boys have larger brains (and heads) than girls - from birth through old age. And girls' brains finish growing earlier than boys'. But neither of these findings explains why boys are more active and girls more verbal or reveals a plausible basis for the consistent gaps in their reading, writing and science test scores that have parents and teachers up in arms" (p22).

Differences in the brain are not fixed, but depend upon experience. In this case, how parents raise boys and girls will influence the developing brain as well as the behaviours shown. Eliot (2010) stated: "Most sex differences start out small - as mere biases in temperament and play style - but are amplified as children's pink- or blue-tinted brains meet our gender-infused culture, including all the tea parties, wrestling matches, playground capers and cafeteria dramas that dominate boys' or girls' existence" (p23).

"True" gender differences will be observed consistently in good quality studies. For example, Eaton and Enns's (1986) meta-analysis of 90 studies found that the average boy is more active than 69% of girls (table 10.1). Note that this means that about one-third of girls are more active than the average boy. But parents tend to encourage activity in boys and discourage it in girls (Eliot 2010).

---

[17] Many studies have looked at individual regions of the brain, but Ingalhalikar et al (2013) focused on the brain as a whole "as a large and complex network known as the human connectome" (a map of neural connections). The researchers, thus, used diffusion tensor imaging (DTI). This is a technique based on magnetic resonance imaging that is able to show the neural tracts in the brain (figure 10.1).

[18] In their own words, Ingalhalikar et al (2013) stated: "Taken together, these results reveal fundamental sex differences in the structural architecture of the human brain. Male brains during development are structured to facilitate within-lobe and within-hemisphere connectivity, with networks that are transitive, modular, and discrete, whereas female brains have greater inter-hemispheric connectivity and greater cross-hemispheric participation". Furthermore, they said: "the results suggest that male brains are structured to facilitate connectivity between perception and co-ordinated action, whereas female brains are designed to facilitate communication between analytical and intuitive processing modes".

(Source: Gigandet et al 2008)

Figure 10.1 - Type of image produced by diffusion MRI.

- Eaton and Enns (1986) concentrated on "activity level" (AL) - "the individual's customary level of energy expenditure through movement. It is helpful to draw an analogy between one's AL and one's disposable income. Just as one's income can be spent for a variety of purposes and in a variety of ways, so too can one's motor energy be directed toward a variety of goals and in a variety of forms... Therefore, acceptable measures of AL include measurements of movement type, frequency, duration, or amplitude, and encompass specific limb movements as well as whole body actions" (p19).

- 90 studies in English were found with a mean sample size of 68 (range: 7 - 25 000), and mean age of 55.5 months (range: 2 months before birth - 30 years).

- A d score (effect size; Cohen 1969) was calculated for each study by the meta-analysis, which is "the difference between male and female means standardised by dividing by the pooled standard deviation" (p21). Positive scores signify that males are more active than females, and vice versa for a negative score. The mean d score was 0.49. Males were more active than females by about

one-half of a standard deviation [19].

- Greater sex differences were found in samples with older participants (>73 months old), where activity was unrestricted (eg: outdoor free play), and with more differentiated specific rating scales (eg: seven-point scale of arm movements, rather than overall movement).

Table 10.1 - Eaton and Enns (1986).

Toy choice emerges at the end of infancy and follows the stereotypical pattern of boys wanting cars and girls dolls. Again the environment is important. For example, Frey and Ruble (1992) found that children picked one of two gender-neutral toys based on the one chosen by same-sex children in a television programme (table 10.2).

- 48 girls and 47 boys aged 5½-9½ years old from New Jersey, USA, watched short film segments. The films involved "toy testers" (ie: children of the same age as the viewers) choosing between two toys. In one experimental condition (viewed by half the children), the choice was between an attractive toy ("Fisher Price Movie Viewer showing Disney cartoon") or an unattractive one (kaleidoscope). The viewers saw one of two endings where either the two boys or two girls toy testing chose the unattractive toy.

- In the second experimental condition (viewed by the other half of children), the choice for the toy testers was between two mechanical pinball machines. The reason for the choice of toy was varied - either typical male ("the motorcycles on this pinball are really cool") or female ("the animals on this pinball are dressed in really pretty colours") statements - given by boys or girls (ie: sex-appropriate or -inappropriate). The children also completed a questionnaire about gender awareness.

- After viewing the film, the children were left to play for five minutes with a selection of toys including those just seen chosen by the toy testers. An observer (blind to which film seen by the children) rated the toy choice.

- Boys, who were gender aware, played with the unattractive toy from the first experimental condition significantly more if chosen by boy testers. In the second condition, boys were also more likely to play with the toy endorsed by a male tester giving a sex-appropriate reason for the choice.

Table 10.2 - Frey and Ruble (1992).

McClure (2000) found, from around 100 studies, that girls are slightly better at recognising facial emotions than boys. Females have a statistically significant

[19] This figure compares with d scores from meta-analyses at the time of other behaviours - eg: 0.45 spatial ability; 0.50 aggression (Eaton and Enns 1986).

advantage in facial expression processing (FEP) [20] as infants, children, and adolescents (as well as adults). Converting the difference into standardised scores, 53% of female children and adolescents perform above average compared to 46% of males, while for infants the figures were 56% and 44% respectively [21].

The greater male variability hypothesis applied to mathematics says that women and men are equally competent at the subject, but men have a greater innate spread of ability (Begley 2012) [22]. Put another way, men have a bimodal distribution of ability (high and low) compared to a normal distribution single peak for women. The upshot is that more men than women are the best at mathematics.

This hypothesis has been challenged by, for example, Kane and Mertz (2012), who analysed data from a number of countries [23]. Male and female variance in mathematics performance is equal in some countries, but varies in other countries with women having the greater variance in some cases. It is argued that such differences between countries reflect social and cultural factors (Begley 2012) [24].

Hyde et al (2008) reported that the mean mathematic performance between men and women in the USA was similar in recent years.

Cognitive-developmental theories of gender (eg: Kohlberg 1966) see children as going through a sequence of stages of understanding gender until full gender awareness/constancy is established.

Before gender constancy (ie: fully aware that belong to one gender group), children will see gender-inappropriate behaviour as a threat and they will show gender-rigid stereotypical behaviour. On the other hand, when gender constancy is established, children ignore gender-inappropriate stimuli, and this explains gender-stereotypical behaviour. Kohlberg preferred the latter interpretation, which Warin (2000) found support for in a UK study.

One hundred children at the end of their first year of school (mean age: 62 months old) were assessed for

---

[20] FEP involves discrimination of stimuli (eg: a smile vs a frown), recognition (interpretation of meaning of expression), and identification (naming emotions shown) (McClure 2000).

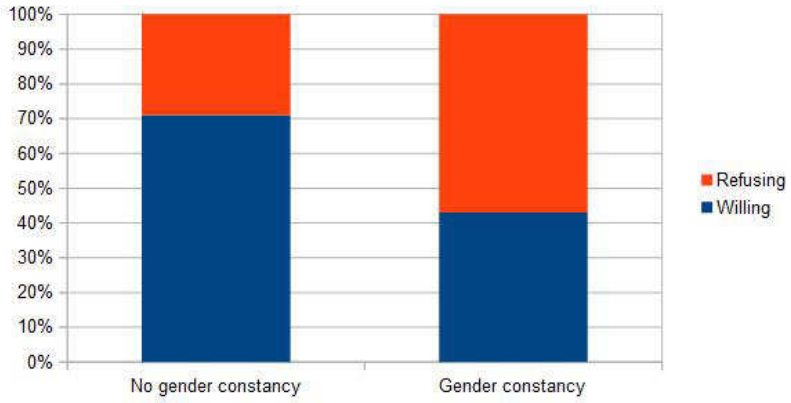
[21] However, McClure (2000) advised some caution about interpreting the results of studies of FEP with infants (eg: small number of studies; high drop-out rate).

[22] This idea was originally proposed in 1894, but recently reiterated by the President of Harvard University (Lawrence Summers) in 2005 (Kane and Mertz 2012).

[23] The Trends in International Mathematics and Science Study (TIMSS) assessed the mathematics abilities of over 13 000 8-9 year-olds in twenty-six countries, and 256 000 12-13 year-olds in 48 countries in 2003 and 2007.

[24] This is called the gender-stratified hypothesis (Kane and Mertz 2012).

gender constancy. They were asked about their preferred toys, activities, and playmates, and about their understanding of gender (eg: "If you got dressed in [opposite-gender] clothes would you be a boy or a girl?"). The children were also asked if they would be willing to be photographed in gender-inappropriate clothes (boys in pink frilly dress and girls in army uniform). There was an association between attainment of gender constancy and gender-stereotypical behaviour (eg: refusing to be photographed in gender-inappropriate clothes) (figure 10.2).



(Data from Warin 2000 table V p225)

Figure 10.2 - Percentage of children willing or refusing to wear gender-inappropriate clothes based on gender constancy.

MEN AND CHILDREN

Warin (2006) explored the experiences of "Ian", a male nursery class teacher, in an unnamed English town using a feminist post-structuralist perspective. This approach "stresses the socially situated nature of subject positions and hence the fluidity of identity. Furthermore, it emphasises the influence of the power relations embedded in each social context experienced by the subject" (Warin 2006 p524). The upshot is that there may be multiple masculine identities, but this can be problematic as there is a dominant (or hegemonic) masculinity.

Warin (2006) discerned three overlapping masculinities from her interviews with Ian:

i) Protector - of family and children. This type of masculinity is shown in Ian's awareness of high profile media cases of male paedophiles working with children, and the fear of such allegations for a man working with

children: "Any accusations made then that's his life kind of wrecked... and you've got to be strong to kind of stay on and fight you know and, and fight for your innocence. You know just stay and stay with your family in the town and try and fight your corner. You've got be a strong person for putting your family through a lot as well" (p530).

ii) Pioneer - "explorer of new territory showing courage in the face of danger/inverted hero". A father ("Callum") described how Ian was a pioneer in doing his job: "He stands up for what he believes in. I've got great respect for him. He's saying 'I'll show them'. People do that 'Oh a male nursery worker' [Callum mimics the derisory tone of the imagined people] so you have to be fairly thick skinned. Especially nowadays" (p532).

iii) Professional expert - "fast tracker to professional seniority". This type of masculinity was the closest to dominant masculinity. Ian was perceived as doing the work to gain expertise to get promotion and status.

Overall, Warin (2006) saw Ian as an example of a world "in which masculinities are in a constant state of tension and competition".

Fathers

The adaptation of women into mothers during pregnancy involves certain hormones, but men do not have these (simply because they are not pregnant) [25]. Yet fathers do show physiological changes. For example, mothers and fathers show a similar pattern of brain activity in response to a baby's cry which non-parents do not (Seifritz et al 2003) [26]. While mice fathers have new neuronal pathways in the brain in relation to smell (of the pups) (Mak and Weiss 2010). This was only the case where fathers had physical contact with the pups, not just smelling them from a nearby cage (Mossop 2011).

From qualitative interviews with thirty men aged 18-

[25] However, increased prolactin (related to milk production in mothers) and oxytocin have been reported in mouse and marmoset fathers (Mossop 2011).

[26] Ten men and ten women with children younger than three years old, and ten men and ten women without children in Switzerland were played six-second bursts of an infant crying or laughing (and a neutral sound) randomly sixteen times while in a FMRI scanner. All the female participants showed less blood flow in the anterior cingulate cortex to the crying and laughing (as compared to the neutral sound), and no difference for the men. Parents of both sexes had greater brain activation in the amygdala region for the crying sound (compared to the neutral sound), and non-parents had greater activation to the laughing.

35 in Norfolk, England, Henwood and Procter (2003) found tension between the "demands" of masculinity and being new fathers as they lived "contemporary fatherhood". For example, the conflict between work and family ("cash and/or care?") as shown by the comments of one man: "I feel as though my work, because my family's number one my work's got to be number one at the moment and it's that, it's that absolutely what seems to be an irreconcilable tension between the fact that you work, you are working for your family and you're trying to build a career. Because you know you want to spend, you're trying to build a career because you want the time and the quality time to spend at home. And you're building a career and as a result you're not getting that quality time to spend at home. So you're wanting both and if you don't have one you haven't got the other half, you know its um its really frustrating" (p346).

REFERENCES

Begley, S (2012) Anything boys can do Scientific American January, p15

Cohen, J (1969) Statistical Power Analyses for the Behavioural Sciences New York: Academic Press

Eaton, W.O & Enns, L.R (1986) Sex differences in human motor activity level Psychological Bulletin 100, 1, 19-28

Eliot, L (2010) The truth about boys and girls Scientific American Mind May/June, 22-29

Frey, K.S & Ruble, D.N (1992) Gender constancy and the "cost" of sex-typed behaviour: A test of the conflict hypothesis Developmental Psychology 28, 4, 714-721

Gigandet, X et al (2008) Estimating the confidence level of white matter connections obtained from MRI tractography PLoS ONE 3, 12, e4006 (Freely available at http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0004006)

Henwood, K & Procter, J (2003) The "good father": Reading men's accounts of paternal involvement during the transition to first-time fatherhood British Journal of Social Psychology 42, 337-355

Hyde, J.S et al (2008) Gender similarities characterise mathematic performance Science 321, 494-495

Ingalhalikar, M et al (2013) Sex differences in the structural connectome of the human brain Proceedings of the National Academy of Sciences, USA (Early edition: http://www.pnas.org/content/early/2013/11/27/1316909110.short)

Kane, J.M & Mertz, J.E (2012) Debunking myths about gender and mathematics performance Notices of the American Mathematical Society 59, 1, 10-21

Kohlberg, L (1966) A cognitive-developmental analysis of children's sex role concepts and attitudes. In Maccoby, E (ed) The Development of Sex Differences Stanford, CA: Stanford University Press

Mak, G.K & Weiss, S (2010) Parental recognition of adult offspring mediated by newly generated CNS neurons Nature Neuroscience 13, 6, 753-758

McClure, E.B (2000) A meta-analytic review of sex differences in facial expression processing and their development in infants, children and adolescents Psychological Bulletin 126, 3, 424-453

Mossop, B (2011) How dads develop Scientific American Mind July/August, 31-37

Seifritz, E et al (2003) Differential sex-independent amygdala response to infant crying anfd laughing in parents versus non-parents Biological Psychiatry 54, 12, 1367-1375

Warin, J (2000) The attainment of self-consistency through gender in young children Sex Roles 42, 2/3, 209-231

Warin, J (2006) Heavy-metal Humpty-Dumpty: Dissonant masculinities within the context of the nursery Gender and Education 18, 5, 523-537

11. EPIGENETICS

Basic reproductive biology involves the inheritance of two copies of a gene (one from the mother and one from the father). But the same gene can act differently if inherited from the mother than the father or vice versa. This is called imprinting, and is an example of epigenetics.

The first imprinted gene discovered was related to a protein called insulin-like growth factor 2 (IGF-2) which regulates the size of a pup in mice (the first species studied). The maternal "version" is "silent" leading to a smaller foetus while the paternal "version" is "on" and a larger foetus is produced (Wenner 2009).

Epigenetics also involves the process by which environmental factors (eg: diet in early life; exposure to environmental pollutants in womb) influence the workings of genes (eg: DNA methylation [27])(ie: chemical changes to DNA). The upshot is that molecular mechanisms can turn gene activity "on" and "off" [28]. For example, if a pregnant agouti mouse is fed a diet high in certain vitamins and amino acids which promote DNA methylation, she will give birth to offspring with one particular coat colour, instead of the normal range of colours. Among humans, individuals whose mothers were malnourished during pregnancy have a higher risk of heart disease as an adult (Bird 2013).

It is thus possible that differences based on socio-economic status (SES) or ethnic background could affect the individual's genes, which in turn affects health, say.

Subramanyam et al (2013) used data from the Stress Ancillary Study of the Multi-Ethnic Study of Atherosclerosis (MESA) in the USA, which follows individuals aged 44-84 years old to see who develops cardiovascular disease.

Based on analysis of DNA from blood samples, clear differences were found between socially advantaged and disadvantaged groups, and between White and African-Americans and Hispanics.

This type of finding shows a physiological mechanism by which early life experiences could lead to later life health problems. For example, poor quality diet in the early years alters the DNA chemically, and this manifests as vulnerability to disease later.

The findings of this study are generalisations based

---

[27] DNA methylation is where a chemical sub-unit called a methyl group adds itself to the four bases (or "letters") of DNA. Methyl groups include carbon and hydrogen (Minkel 2010). These additions are then passed on to future generations (Bird 2013).

[28] The definition of epigenetics itself varies (Bird 2013).

on groups, and will not necessarily explain individuals who are different (eg: low SES without health problems). Also any difference based on ethnicity is politically sensitive.

Adults with bipolar disorder tend to have experienced more childhood maltreatment and early-life adversity than controls, and more childhood maltreatment is associated with earlier onset of the disorder, rapid cycling (ie: speed of change between high and low and vice versa), more psychotic symptoms, and increased suicidal behaviour (Perroud et al 2014).

Early-life stress is known to modify brain development through the hypothalamic-pituitary-adrenal (HPA) axis (seen first in rats, and then in humans). But recent research in epigenetics has highlighted increased NR3C1 methylation [29] in the hippocampus of rats who experienced poor maternal care (Perroud et al 2014).

Perroud et al (2014) found that NR3C1 methylation seemed to be the epigenetic process through which early-life stress had an effect on the HPA axis, and consequently on brain development among ninety-nine individuals with bipolar disorder in Geneva, Switzerland. The participants completed the Childhood Trauma Questionnaire (CTQ) (Bernstein and Fink 1998), which measures five types of trauma - sexual abuse, physical abuse, physical neglect, emotional abuse, and emotional neglect). A blood sample was also taken to allow DNA methylation analysis.

Overall, 30% of the sample reported sexual abuse, 33% physical abuse, 29% physical neglect, 48% emotional abuse, and 56% emotional neglect. Altogether, 7% of individuals had experienced all five traumas, while one-quarter none.

Higher CTQ scores were associated with greater NR3C1 methylation, and also the severity of the trauma with the methylation.

REFERENCES

Bernstein, D.P & Fink, L (1998) Childhood Trauma Questionnaire: A Retrospective Self-Report New York: Psychological Corporation

Bird, A (2013) Epigenetics New Scientist 5/1, Instant Expert 29, i-viii

Minkel, J.R (2010) Hereditary acquisitions Scientific American August, 14-15

Perroud, N et al (2014) Childhood maltreatment and methylation of the glucocorticoid receptor gene NR3C1 in bipolar disorder British Journal of Psychiatry 204, 30-35

[29] Promoter region of the glucocorticoid receptor gene.

Subramanyam, M.A et al (2013) Social factors and leukocyte DNA methylation of repetitive sequences: The Multi-Ethnic Study of Atherosclerosis PLoS ONE 8, 1, e54018 (Freely available at http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0054018)

Wenner, M (2009) A patchwork mind Scientific American Mind July/August, 52-59

12. ESTABLISHING CO-MORBIDITY

Specific learning or developmental disorders relating to arithmetic, reading, and spelling often go together (co-morbid). But the amount of co-morbidity is unclear as studies vary. For example (Landerl and Moll 2010):

- 17-70% of children with arithmetic disorder (AD) have reading problems.
- 11-56% of children with reading disorder (RD) have arithmetic problems.
- 47-70% of children with AD show spelling problems.
- 36-42% of children with spelling disorder (SD) show arithmetic problems.

Landerl and Moll (2010) explained the large variability in prevalence rates as due to:

i) Different measures of arithmetic, reading, and spelling used between studies.

ii) Different cut-off points for defining problems. "Liberal cut-off criteria are likely to include not only children with a neurobiological deficit, but also individuals whose problems are rather environmental in origin... Environmental factors like low parental support will often affect not just one domain of academic achievement, inflating co-morbidity rates" (Landerl and Moll 2010 p288).

iii) The population sampled and size of sample.

Landerl and Moll (2010) used 2586 8-12 year-olds from schools in urban Austria in their study [30]. Standardised tests, with mean scores for different age groups, were used to measure the variables:

- Reading - Three minutes to read sentences like "strawberries are very blue" and say if meaning is correct.

- Spelling - 24 or 48 words.

- Arithmetic - Two minutes to do addition, subtraction, multiplication, and division sums.

Two cut-offs were used for defining a problem. A liberal cut-off of one standard deviation below the mean,

[30] Children with German as their second language, and children with general learning disabilities were excluded.

and a strict cut-off of 1.5 standard deviations below the mean.

Using the stricter cut-off, 6.1% of children had AD, and of them, a quarter (25.7%) also had RD, and over one-third (37.2%) SD. For the 7% of all child with RD, 22.7% also had AD and 49.2% SD. Overall, 8.8% of children had SD, which went with AD for 25.9% and RD for 39%.

REFERENCES

Landerl, K & Moll, K (2010) Co-morbidity of learning disorders: Prevalence and familial transmission Journal of Child Psychology and Psychiatry 51, 3, 287-294